

# ROBERT CRAIG GROUP

## Curriculum Vitae

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## RESEARCH EXPERIENCE

**Associate Professor of Physics** : University of Virginia 2016 – present  
(Associate Scientist at Fermilab – position is joint with Fermilab)

Research on the Mu2e and NOvA experiments at Fermilab. Lead of the fabrication effort for the Mu2e cosmic-ray-veto system which will be constructed at UVA and shipped to Fermilab. Our focus on the NOvA experiment is shifting from exotic searches to contributions to mainstream neutrino analyses with the hope of answering major questions in neutrino physics with the full NOvA data set.

**Assistant Professor of Physics** : University of Virginia 2010 – 2016  
(Associate Scientist at Fermilab – position is joint with Fermilab)

Research with leadership positions on the CDF, Mu2e, and NOvA experiments at Fermilab: level-3 manager of the fabrication effort of the cosmic-ray-veto system on the Mu2e experiment; convener for the computing effort on the NOvA experiment; and leader of the low-mass Higgs boson search at the CDF experiment where evidence was first reported for a Higgs boson-like particle decaying to  $b$ -quark pairs and produced in association with a vector boson.

**Research Associate:** Fermilab 12/2006 – 8/2010

Major contributions to the first observation of electroweak top quark production and the search for the Higgs boson produced in association with a  $W$  boson. Coordinated the simulation of event samples for the Higgs discovery group and served as convener for the Single Top and  $WH \rightarrow \ell\nu b\bar{b}$  analysis groups. Also directed students on cosmic-ray-veto studies for the Mu2e experiment, and on a search for Higgs bosons decaying into two photons.

## EDUCATION

**Ph.D. in Physics, Dec. 2006. (GPA=4.0)** Gainesville, FL  
University of Florida, Advisor: Richard D. Field and Konstantin Matchev  
Thesis: *Inclusive Jet Production using the Midpoint Algorithm in Run II at CDF*

**M.S. in Physics, Aug. 2001. (GPA=3.8)** Tallahassee, FL  
Florida State University, Advisor: Harrison B. Prosper

**B.A. in Physics, May 1999.** Due West, SC  
Erskine College

## RECENT RESEARCH HIGHLIGHTS

### Mu2e Experiment: 2009 - present

#### **Management of CRV fabrication effort:** May 2010 - present

UVA is a leader in the design and construction of a detector that will be used to veto false signals in the Mu2e experiment caused by cosmic rays muons. The plan is to construct this major detector system over the next five years at UVA and ship it to Fermilab. I serve as the deputy manager of the CRV project, and I am the manager of the fabrication effort (in total, the CRV project cost is ~\$8M).

#### **R&D efforts for the CRV detector:** 2009 - present

Led group members (postdoc, technicians and students) on assembly and commissioning of prototype cosmic ray veto detectors for the Mu2e experiment. These efforts include several test-beam runs at Fermilab, studies of the properties of fiber and photodetectors, measurements and simulations of the effects of neutron radiation on the CRV detector, and investigations of the fabrication plan.

### NO $\nu$ A Experiment: 2012 - present

#### **Convener of the computing effort:** 2012 - 2015

Working to streamline the computing environment so the processing of the first experimental data will be successful. I lead about several post-doctoral researches and graduate students on these computing efforts. I estimate required resources for the experiment and negotiate with the Fermilab computing division and laboratory management on behalf of the NO $\nu$ A spokespeople.

#### **Dark Matter Searches at NO $\nu$ A:** 2012 - present

I am leading the effort to investigate using the NO $\nu$ A detector as a neutrino telescope to search for dark matter annihilation in the center of the Sun. I have assembled a team that is studying the feasibility of this search. The trigger we implemented will also be useful for atmospheric neutrino studies.

### CDF Experiment:

#### **First observation of $s$ -channel single top quark production:** 2013 - 2014

This effort, when combined with results from the D0 experiment, led to the first observation of this rare process. I mentored my student, Hao Liu, on this project, I coordinated the combination effort with the D0 experiment, and I was a primary author of both the CDF and the Tevatron papers that reported this observation.

#### **Co-convener of the Higgs Analysis Group:** 2011 - 2012

Served as a leader of the search for the Higgs boson at the CDF experiment. The search included more than ten search channels and about 100 scientists. During my term we searched the full dataset from the Tevatron, and by combining many search channels, we reported the first evidence for a new particle (likely the Higgs boson) in the  $b\bar{b}$  decay mode.

#### **Convener of the $WH \rightarrow \ell\nu b\bar{b}$ analysis group:** 2009 - 2011

We improved the sensitivity of the  $WH \rightarrow \ell\nu b\bar{b}$  by more than a factor of two beyond what was expected from adding additional luminosity. I led the effort to add many of these analysis improvements. This is the most sensitive search channel for the Higgs boson search in the  $b\bar{b}$  decay mode.

#### **Led effort for UVA to join the CDF experiment:** 2010

The CDF experiment includes about 50 institutions from around the world and more than 400 scientists. For the last 5 years, the University of Virginia has officially been a member of the CDF collaboration and I served as the UVA representative on the CDF Executive Board.

## PAST RESEARCH HIGHLIGHTS

### CDF Experiment:

#### **Convener of the single top group:** 2008 - 2009

Managed and coordinated the efforts of the single top analysis group of the CDF experiment. During the time I served as convener we observed (discovered) single top quark production for the first time, and made the most precise measurement to date of the single top production cross section and the CKM matrix element  $V_{tb}$ .

#### **Observation of electroweak single top production:** 2009

Directed a graduate student on the development of an analysis method employing boosted decision trees to search for single top production. Developed a method to take muon events which did not trigger the CDF data acquisition system by using an alternative trigger based on missing transverse energy and jets. Combined the three single top results using a technique based on best linear unbiased estimators which resulted in an additional 9 % improvement to sensitivity. These efforts crucial to the first observation of electroweak single top production by the CDF experiment.

#### **Muon trigger improvements:**

Designed, implemented, and tested new triggers for muons located in gap regions of the CDF muon systems. These improved triggers increase signal acceptance for the Higgs boson and single top search channels by about 15 %.

#### **Higgs group Monte Carlo coordinator:** 2007 - 2008

Simulated Higgs boson signal events and advised analysis groups on their use for all Higgs boson searches at the CDF experiment. Designed, instituted, and maintained an automated web tool which made new samples available to the experiment.

#### **Search for standard model Higgs boson:** 2006 - 2009

Applied the matrix element and boosted decision tree techniques, which were developed for the single top analysis, to a search for the Higgs boson produced in association with a  $W$  boson. Worked to combine this result with a sister analysis based on neural networks. Published the combined result in PRL as the most sensitive Tevatron low-mass Higgs boson search at that time.

#### **QCD studies** 2005 - 2009

- Measured the inclusive jet cross section in the forward region of the CDF detector for the first time with a cone algorithm.
- Measured the properties of the underlying event in CDF collisions.
- Used the technique of dijet  $P_T$ -balancing to test and maintain the jet energy relative corrections.

### DØ Experiment:

#### **Monitoring and control tools:** 2000 - 2001

Developed graphical user interface tools in the PYTHON programming language to monitor and control DØ detector components. Specifically, involved in the calorimeter and the silicon track trigger monitoring tools.

### Other Efforts:

#### **Computing accomplishments:** 2002 - 2006

- Developed and investigated tools for accessing parton density functions. Specifically an interface to the Les Houches Accord was developed so that it could be used trivially with the common Monte Carlo programs PYTHIA and HERWIG.

#### **Phenomenology of supersymmetry:** 2003 - 2004

- Led a student on the development a web-based tool which calculates supersymmetric mass spectra and cross sections SUPERSIM.

## RECENT FUNDING

Approximate DOE and project funds for my efforts (2010-2018) – **\$1,400,000**

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- **DoE UVA Intensity Frontier task – \$1,500,000:** 2015-2018  
( $\sim 2/5$  of this support is for my efforts, \$600k)
- **DoE UVA Intensity Frontier task – \$1,100,000:** 2012-2015  
( $\sim 1/3$  of this support is for my efforts, \$400k)
- **Mu2e Project Award \$700,000:** FY2013-FY2015  
( $\sim 1/2$  of this support is for efforts that I manage, \$350k)
- **DoE supplementary for CDF experiment – \$58,000:** 2011-2013

### Start-up funds:

- **UVA – \$250,000:** 2010-2013
- **Fermilab (travel and summer Salary)  $\sim$  \$100,000:** 2010-2015

### PPRA Summer Program:

- **Jefferson Trust grant – \$28,800:** 2012-2015
- **Fermilab support –  $\sim$ \$25,000:** 2012-2015

### Other:

- **Page-Barbour Grant – \$10,000:** 2016-2017 (PI)
- **HEET equipment funds – \$90,000:** 2000-2015 (+1 co-PI)
- **URA Visiting Scholar Award (faculty host) – \$20,000:** 2011-2012
- **Mead Honored Faculty – \$3000:** 2012
- **Dean’s travel awards – \$1600:** 2012-2015
- **Undergraduate and graduate student travel awards –  $\sim$ \$8000:** 2011-2015
- **Undergraduate summer fellowships –  $\sim$ \$25,000:** 2011-2016

## HONORS AND AWARDS

|   |                   |
|---|-------------------|
| <b>Cory Family Teaching Award</b><br>Annual award recognizing excellence in undergraduate instruction at UVA                      | 2015              |
| <b>Recognized at Terman Award Recipient Banquet</b><br>Recognized as outstanding pre-college mentor for award recipient, Stanford | 2013              |
| <b>Mead Honored Faculty Recipient</b><br>Project for undergraduate students to explore and develop physics demos                  | 2012              |
| <b>Outstanding Mentor Award</b><br>DOE Office of Science, for mentoring students on the CDF experiment                            | 2009              |
| <b>Alumni Fellowship</b><br>Department of Physics, University of Florida  | 08/2002 – 08/2006 |
| <b>Marsh W. White Award (Sigma Pi Sigma)</b><br>Design of a Foucault pendulum to be publicly displayed at Erskine College         | 1999              |

## DEPARTMENTAL SERVICE

**Undergraduate Program Committee**, 2015-2017

**Faculty Advisor to SPS and Sigma Pi Sigma**, 2013-2017

– Recognized by SPS as Distinguished (2013,2014,2015), Outstanding (2016)

**Organized trip for students to PhysCon**, 2016

**Ph.D. Committees:** Ji Liu (William and Mary, 2016), John Wood and Tim Pennucci (2015), Hao Liu and Rachael Beaton (2014)

**Research Review Committees:**

– Diancheng Wang, Joey Goodell, Sha Li, Wei Xiao, Charles Glaser, and Trinh Le

**Graduate Recruitment Fair Participant**, SESAPS 2014

**Physics Building Renovation Committee**, 2014

**Undergraduate Advising**, 2011-2012,2013-2014, 2016-2017

**Judge for Undergraduate Research Symposium**, 2013

**Long Range Planning Committee**, Elected by faculty, 2013

**High Energy Physics Seminar Organizer**, 2013-2015

**Graduate Program Committee**, 2012-2013

**Graduate Student Poster Session Judge**, 2011,2013

## COMMUNITY SERVICE

**Reviewer**, DOE Early Career Award Application Reviewer: 2016, 2017

**Member** Fermilab Computational Science Strategy Group, 2016

**Convener**, Muon Working Group for NuFact Conference, 2016-2019

**Organizing Committee**, 2016 SESAPS Meeting, Charlottesville, VA, November 2016

– Also session chair for low-energy parallel.

**Organizing Committee**, PASCOS 2016, Quy Nhon Vietnam, July 2016

– Also organized low-energy parallels and chaired plenary session.

**Organizing Committee**, International Conference on Charged Lepton Flavor Violation 2016, Charlottesville, VA, May 2016

**Session Chair**, Parallel Session, CHEP2015, Okinawa Japan, April 2015

**Session Chair**, HEP Parallel Session, SESAPS, Columbia SC, Nov 2014

**Session Chair**, Fermilab Users Meeting, Batavia IL, June 2014

**Participant** Fermilab UEC trip to D.C., advocate for fundamental science, 2013-2016

**Organizer**, Fermilab UEC trip to D.C., advocate for fundamental science, 2013 and 2014

**Contributor**, P5 Virtual Town Hall Meeting, particle physics planning exercise, 2013

**Organizer**, Fermilab Symposium, UEC non-academic job discussion, 2013

**Session Chair**, Top Physics Plenary Session, APS, Atlanta GA, April 2012

**Scribe**, Charged Lepton Session, Intensity Frontier Workshop, Rockville MD, Nov. 2011

**Session Chair**, Higgs Physics Parallel Session, SESAPS, Roanoke VA, Oct. 2011

**Session Chair**, Low Energy Searches Parallel Session, DPF, Providence RI, July 2011

**Poster Session Judge**, Fermilab User's Meeting, 2008,2013

## EXPERIMENT AND PROJECT REVIEW EXPERIENCE

**Mu2e CRV Module Factory Safety Review**, September 2016

**Mu2e DOE CD3 Review**, June 2016

**Mu2e Fermilab Director's Review, CD3**, April 2016

**Mu2e Final Design Review**, February 2016

**Reviewer: Mu2e Offline Computing Review**, February 2014

**NO $\nu$ A Computing Portfolio Management Review**, Jan. 2013, April 2014, Jan. 2015

**NO $\nu$ A Fermilab Director's Readiness Review**, Nov.2014

**Mu2e DOE CD2 Review**, October 2014

**Mu2e Independent Cost Review**, August 2014

**Mu2e Fermilab Director's Review, CD2**, July 2014

**Mu2e DOE CD1 Review**, 2012

**Mu2e DOE CD0 Review**, 2009

## REFeree EXPERIENCE

- 4 papers - **Physical Review Letters** 2011, 2012, 2014, 2016
- 4 papers - **Physical Review D.** 2011, 2012, 2013, 2014
- 4 papers - **Phys. Letters B** 2012,2013,2014,2015

## MEMBERSHIP

- American Physical Society (lifetime member)
- Speaker’s board for the Mu2e Experiment (2016-2017)
- Publication board for the Mu2e Experiment (2014-2015)
- Mu2e committee on authorship policy (2014)
- NOvA committee on publication policy (2012-2013)
- CDF committee on data preservation (2012-2013)
- Tevatron New Phenomenon and Higgs Working Group (2011 - 2013)
- National Scholars, Honor Society (inducted 2007)
- Phi Kappa Phi, Honor Society (inducted 2006)
- Philomathean Literary Society
- Kappa Mu Epsilon, Mathematics Honor Society
- Sigma Pi Sigma, Physics honor society

## LEADERSHIP

- Level-3 manager of fabrication for Cosmic Ray Veto of the Mu2e experiment (2011 -)
- Deputy Level-2 manager for Cosmic Ray Veto of the Mu2e experiment (2015)
- Computing convener for the NOvA experiment (2012-2015)
- Elected member of the Fermilab Users’ Executive Committee (2012 - 2014)
- > Secretary (2013-2014)
- > Quality of Life, Users’ Meeting, and Government Relations subcommittees
- Executive Board member for the CDF Experiment (2011 - 2013)
- Higgs Analysis Group co-convener of CDF experiment (2011 - 2013)
- WH and Single Top sub-group convener of CDF experiment (2008 - 2011)
- Philomathean Literary Society, President (1999, Erskine College), Vice President (1998)
- Kappa Mu Epsilon, President (1999, Erskine College)

## MENTOR EXPERIENCE

I recently graduated my first Ph.D student at UVA and I have a history of success at receiving support for and directing undergraduate and high school students on research projects in experimental particle physics. In addition to the list below, I have served as a mentor to dozens of students and postdoctoral researchers through my leadership roles on the CDF, Mu2e, and NO $\nu$ A experiments. In 2011 I started a summer research program with support from the UVA Jefferson Trust for undergraduate physics majors at UVA in which two students each summer engage in an intense research experience at Fermilab. In 2009 I was recognized with the Outstanding Mentor Award by the US Department of Energy for my work with undergraduate students on the CDF experiment.

### Postdoctoral Researchers

**Yuri Oksuzian**, University of Virginia, Summer 2010 - current

Yuri plays a leading role in the R&D efforts for the cosmic ray veto system of the Mu2e experiment where he currently serves as a co-converner for the Neutron and Gamma Working group. On the CDF experiment, Yuri optimized the  $b$ -jet tagging strategy of the low-mass Higgs effort at CDF. This work resulted in significant gains in the sensitivity of the Higgs search at the Tevatron. Yuri was selected as a 2011 URA Visiting Scholar and received \$20,000 to support his research efforts at Fermilab. Recently, Yuri joined the NO $\nu$ A experiment where he has done database work and made major contributions to our group's effort to use NO $\nu$ A as a neutrino telescope for dark matter searches.

### Current and Recent Graduate Students

**Hao Liu**, University of Virginia, Ph.D. 2014

Measurement of the  $s$ -channel Single Top Quark Cross Section at the CDF Experiment and Contributions to the Evidence of  $H \rightarrow b\bar{b}$  at the Tevatron.

**Serdar Kurbanov**, University of Virginia, M.S. 2016

Data Driven Trigger Design and Analysis for the NO $\nu$ A experiment

**Cristiana Principato**, University of Virginia, Started 2015

Cristiana passed the Qualifier exam in May 2015 and will do her thesis work on the NO $\nu$ A experiment.

### Current and Recent Undergraduate Students

#### **Design and Fabrication of the Mu2e Cosmic Ray Veto:**

**Hannah Kessenich** (May 2015 - May 2016), **Tanner Rase** (Jan. 2015 - May 2016), **Gage DeZoort** (June 2015 - May 2016), **Pedrom Zadeh**, **Cole Miles**, **Tyler Lam**, **Nina Mazzarelli**

#### **Research Adventure in Particle Physics at Fermilab for UVA Undergrads:**

(<http://faculty.virginia.edu/ParticlePhysicsAdventure/>)

- Searches for dark matter at the NO $\nu$ A experiment: **Rob Mina** (Jan. 2014 - Dec. 2015) **Eric Culbertson** (Jan. 2015 - Dec. 2015), **Eric Fries** (Jan. 2014 - Dec. 2014), **Sophia Xiao** (Jan. 2013 - Dec. 2013), and **Ranjani Sarma** (Jan. 2013 - Dec. 2013)

- **Yongyi Wu** (Jan. 2014 - Dec. 2014): Analysis of test beam data for a prototype cosmic ray veto system

- **David Wilson** (Feb. 2012 - Dec. 2012): Studies of the CDF energy-scan data

- **Alyssa Henderson** (Feb. 2012 - Dec. 2012): SiPM R&D for Mu2e

#### **Directed Research of UVA Physics Major (2011 - 2013):**

- **Kaitlin Johnson** (May 2012 - Dec. 2012): Simulated shielding of fast neutrons. - **David**

**Abbott** (May 2011 - Aug. 2012): Investigated sensitivity of plastic scintillator to fast neutrons.

- **Jeff Lansford** (2011): Analyzed data from cosmic ray veto prototype for the Mu2e experiment.

- **Eric Nguyen** (2011): Considered design issues for the cosmic ray veto for the Mu2e experiment.



#### Past Graduate Students

**Karen Bland**, Baylor University, Ph.D. Summer 2012

Karen focused on optimizing a standard model Higgs boson search by improving photon identification efficiency and background rejection.

**Barbara Alvarez**, Universidad de Oviedo, Spain; Ph.D. completed 2010

Search for a Higgs boson produced in association with a W boson. Barbara focused her efforts on improving the jet energy resolution information which is used in the matrix element analysis.

**Bruno Casal**, Universidad de Cantabria, Spain; Ph.D. completed 2009

Observation of Single Top Quark production. Bruno focused his efforts on improving muon signal acceptance and optimizing search techniques using boosted decision trees.

#### Past Undergraduate and High School Students

**High School Students on Mu2e (Summer 2009 and 2010)**: Led local high school students on R&D for the cosmic ray test stand of the Mu2e experiment.

**IMSA Student at CDF (2007 - 2009)**: Supervised an Illinois Math and Science Academy high school student on an analysis of CDF data which searched for the Higgs boson decaying to two photons. The student was extremely successful, we wrote two PRLs based on his efforts.

**Italian Summer Student (2008)**: Wrote a proposal for and supervised a participant of the INFN-DOE Summer Students program from Pisa, Italy on CDF dijet resonance search.

**SULI Summer Student at CDF (2008)**: Wrote a proposal for and supervised a participant of the DOE's Science Undergraduate Laboratory Internships program on CDF dijet resonance search.

**Pre-Service Teaching Internship at CDF (2007)**: Wrote a proposal for and supervised a participant of the DOE's Pre-Service Teaching internship on an analysis of CDF data which searched for the Higgs boson decaying to two photons.

**REU Summer Student (2003)**: NSF REU program at the University of Florida. Student developed a web-based tool which calculates supersymmetric mass spectra and cross sections.



## RECENT CONFERENCE TALKS AND SEMINARS

### *“Recent Results from NOvA”*

- Lake Louise Winter Institute, [Canada](#), Feb. 2017
- XXX Rencontres de Physique de la Vallée d’Aoste, La Thuile, [Italy](#), March 2016

### *“Hoos at Fermilab”*

Colloquium, University of Virginia, Sept. 2015

### *“The Mu2e Experiment at Fermilab”*

Invited, Conference on Intersections of Particle and Nuclear Physics, Vail, CO, May 2015

### *“Computing at the Intensity Frontier”*

Plenary, Conference on Computing in High Energy Physics (CHEP), Okinawa, [Japan](#), April 2015

### *“Status of the NOvA Experiment”*

Invited, South Eastern section of APS (SESAPS), Columbia, SC, Oct. 2014

### *“Studies of Single Top Production at the Tevatron”*

XXVIII Rencontres de Physique de la Vallée d’Aoste, La Thuile, [Italy](#), Feb. 2014

### *“Design considerations for the cosmic-ray-veto system of the Mu2e experiment”*

Meeting of the APS Division of Particles and Fields, UC Santa Cruz, Aug. 2013

### *“Higgs Boson Searches at the Tevatron”*

- Lake Louise Winter Institute, [Canada](#), Feb. 2013
- Colloquium, College of William and Mary, Jan. 2013
- Colloquium, University of Virginia, Sep. 2012
- Invited, APS April Meeting, Atlanta, GA, April 2012

### *“Recent Results from the Tevatron”*

Invited, Workshop on The LHC, Particle Physics, and the Cosmos, Auckland, [New Zealand](#), July 2012

### *“Tevatron Higgs Searches: Past and Future”*

Invited, The Next Stretch of the Higgs Magnificent Mile, Chicago, IL, May 2012

### *“Charged Lepton Flavor Violation Discussion Summary Report”*

Intensity Frontier Workshop, Rockville, MD, Nov. 2011

### *“The Impact of Higgs Searches at the Tevatron in the LHC Era”*

- Invited, South Eastern Section of APS (SESAPS), Roanoke, VA, Oct. 2011
- Physics Seminar, James Madison University, Oct. 2011

### *“Status and Summary of the Mu2e Experiment”*

- Meeting of the APS Division of Particles and Fields, Brown University, Aug. 2011
- Invited, Fermi National Accelerator Laboratory, Users’ Meeting, June 2011

### *“Low-mass Higgs Searches at the Tevatron”*

Workshop on Higgs Cross Sections for the LHC, Brookhaven National Laboratory, NY, May 2011

### *“Searches for New Physics at the Tevatron”*

Plenary, DIS2011, Newport News, VA, April 2011

## PAST CONFERENCE TALKS AND SEMINARS

### ***“Recent Studies of the Underlying Event from CDF”***

Northwestern University HEP Seminar, Evanston, IL, May 2010

### ***“The Race for the Higgs Boson”***

- University of Virginia physics colloquium, March 2012
- University of Alabama physics colloquium, March 2010
- FIU Physics Colloquium, Miami, FL, April 2009

### ***“A Foundation for Low-Mass Higgs Searches”***

Lawrence Berkeley National Laboratory, CA, Jan. 2010

### ***“R&D Plans for the Cosmic Ray Veto System”***

Mu2e Collaboration Meeting, Rice University, Jan. 2010

### ***“Status of Low-Mass Higgs Searches at the Tevatron”***

SLAC Experimental Seminar, Menlo Park, CA, November 2009

### ***“Lighting up the Higgs sector with photons at CDF”***

- Notre Dame HEP Seminar, Notre Dame, IN, November 2009
- University of Wisconsin HEP Seminar, Madison, WI, April 2009

### ***“Low Mass Higgs Boson Search Improvements at CDF”***

Tevatron Higgs Workshop, Fermilab, May 2009

### ***“The Observation of Single Top Production at the Tevatron”*** (April 2009)

- University of Victoria HEP Seminar, Victoria, [Canada](#)
- TRIUMF National Lab Seminar, Vancouver, [Canada](#)

### ***“Searching for the Higgs One Single Top at a Time”*** (Jan. – Feb. 2009)

- FSU HEP Seminar, Tallahassee, FL
- MSU HEP Seminar, East Lansing, MI
- Michigan HEP Seminar, Ann Arbor, MI

### ***“Status of Higgs Searches at CDF”***

- Instituto de Fisica de Cantabria HEP Seminar, Santander, [Spain](#), March 2008
- University of Florida HEP Seminar, Gainesville, FL, Feb. 2008
- Lake Louise Winter Institute, Alberta, [Canada](#), February 2009

### ***“Recent QCD Results from the Tevatron”*** (Jan. - Feb. 2008)

- XXII Rencontres de Physique de la Vallee d’Aoste, La Thuile, [Italy](#)
- Argonne HEP Seminar, Argonne National Lab

### ***“The Inclusive Jet Cross Section at CDF”*** (Feb. - Sept. 2006)

- FSU HEP Seminar, Tallahassee, FL
- Seminar at the Enrico Fermi Institute, Chicago, IL
- Vanderbilt Nuclear and Particle Physics Seminar, Nashville, TN
- Pheno Symposium, Madison, WI
- University of Florida HEP Seminar, Gainesville, FL
- APS April Meeting, Dallas, TX
- CDF Collaboration meeting, FNAL, IL
- UF-FSU Phenomenology Symposium, Tallahassee, FL, December 2004

## MENTEE TALKS AND SEMINARS

### Yuri Oksuzian, postdoctoral researcher:

*“Wavelength-Shifting Fiber Performance for the Mu2e Cosmic Ray Veto”*

– Second International Conference on Charged Lepton Flavor Violation, Charlottesville, VA, June 2016 – APS Meeting of Division of Particles and Fields, Detroit, MI, 2015

*“Studies of Beam Induced Radiation Backgrounds for the Cosmic Ray Veto Detector Operations at the Mu2e Experiments”*

– International Conference on High Energy Physics (ICHEP), Chicago, IL, August 2016  
– Second International Conference on Charged Lepton Flavor Violation, Charlottesville, VA, June 2016 – APS Meeting of Division of Particles and Fields, Detroit, MI, August 2015

*“A Cosmic Ray Veto Detector for the Mu2e Experiment at Fermilab”*

APS Meeting of Division of Particles and Fields, Detroit, MI, August 2015

*“The Mu2e Experiment”*

– International Symposium on Symmetries in Subatomic Physics, Victoria, [Canada](#), June 2015  
– Fermilab Users Meeting, Batavia, IL June 2014

*“Latest Results from the Tevatron”*

16th Lomonosov Conference on Particle Physics, Moscow, [Russia](#), Aug. 2013

*“Searches for New Physics in Top Events at the Tevatron”*

Moriond QCD, La Thuile, [Italy](#), March 2013

*“Higgs Boson Searches at the Tevatron”*

– Annual Postdoctoral Research Symposium, Argonne, Sept. 2012  
– BNL Physics Seminar, Upton, NY, Aug. 2012  
– Invited, CIPANP 2012, St. Petersburg, FL, May 2012

*“Improved  $b$ -tagging strategy for Higgs Boson Searches at CDF”*

APS April Meeting, Atlanta, GA March 2012

*“R&D Effort for the Cosmic Ray Veto System of the Mu2e Experiment”*

Technology and Instrumentation in Particle Physics, Chicago, IL June 2011

*“Cosmic Ray Veto R&D for the Mu2e Experiment”*

New Perspectives, Batavia, IL June 2011

### Hao Liu, graduate student:

*“Top Quark Production at the Tevatron”*

Conference on Large Hadron Collider Physics, New York City, NY, June 2014

*“Measurement of  $s$ -channel single-top-quark production in lepton+jets at CDF”*

APS Meeting of Division of Particles and Fields, Santa Cruz, CA Aug. 2013

*“Improving the Trigger Efficiency for the  $WH$ - $lbb$  analysis at CDF”*

– APS April Meeting, Atlanta, GA March 2012  
– South Eastern section of APS (SESAPS), Roanoke, VA, Oct. 2011

### Cristiana Principato, graduate student:

*“Searching for Dark Matter Using the NOvA Upward-going Muon Trigger”*

International Conference on High Energy Physics (ICHEP), Chicago, IL, August 2016

## Undergraduate students:

### **“Techniques for the Dark Matter Search at the NOvA Experiment”**

- Rob Mina, DPF Meeting, Ann Arbor, MI, August 2015
- Rob Mina, Poster, Computing in High Energy Physics, Okinawa, [Japan](#), April 2015
- Rob Mina, Poster, Fermilab Users Meeting, Batavia, IL, June. 2015
- Rob Mina, SESAPS, Columbia, SC, Nov. 2014
- Eric Fries, SESAPS, Columbia, SC, Nov. 2014
- Liting Xiao, SESAPS, Boiling Green, KY, Nov. 2013
- Ranjani Sarma, SESAPS, Boiling Green, KY, Nov. 2013

### **Tyler Lam “Accelerated Aging Studies for the Mu2e Cosmic Ray Veto System”**

Poster, South Eastern section of APS (SESAPS), Charlottesville, VA, Nov. 2016

### **Nina Mazzearelli “Studies of Silicon Photomultiplier Detector Performance”**

Poster, South Eastern section of APS (SESAPS), Charlottesville, VA, Nov. 2016

### **Yongyi Wu: “Test beam studies of the Mu2e Cosmic-Ray-Veto Prototypes**

- Poster, Fermilab Users Meeting, Batavia, IL, June. 2015
- SESAPS, Columbia, SC, Nov. 2014

### **Alyssa Henderson: “*Studies of Silicon Photomultipliers for the Mu2e Experiment*”**

South Eastern section of APS (SESAPS), Tallahassee, FL, Nov. 2012

### **David Wilson: “*Minimum-bias studies at the Tevatron*”**

South Eastern section of APS (SESAPS), Tallahassee, FL, Nov. 2012

### **David Abbott: “*Sensitivity of Plastic Scintillator to Fast Neutrons*”**

- South Eastern section of APS (SESAPS), Roanoke, VA, Oct. 2011
- Award for Best Undergraduate Oral Presentation
- UVA Presidential Poster Competition, 2011

# Robert Craig Group

## PUBLICATION LIST

### Recent Publications in Refereed Journals

- [1] “*First measurement of electron neutrino appearance in NOvA*”, Phys.Rev.Lett. 116, 151806 (2016)
- [2] “*First measurement of muon-neutrino disappearance in NOvA*”, Accepted for publication in PRD, Phys. Rev. D. 93, 051104 (2016)
- [3] “*A Study of the Energy Dependence of the Underlying Event in Proton-Antiproton Collisions*”, Phys. Rev. D. 92, 092009 (2015)
- [4] “*Tevatron Constraints on Models of the Higgs Boson with Exotic Spin and Parity Using Decays to Bottom-Antibottom Quark Pairs*”, Phys. Rev. Lett. 114, 151802 (2015)
- [5] “*Constraints on models of the Higgs boson with exotic spin and parity using the full CDF data set*”, Phys. Rev. Lett. 114, 141802 (2015)
- [6] “*Observation of s-channel production of single top quarks at the Tevatron*”, Phys. Rev. Lett. 112, 231803 (2014)
- [7] “*Evidence for s-channel Single-Top-Quark Production in Events with one Charged Lepton and two Jets at CDF*”, Phys. Rev. Lett. 112, 231804 (2014)
- [8] “*First Search for Exotic Z Boson Decays into Photons and Neutral Pions in Hadron Collisions*”, Phys. Rev. Lett. 112, 111803 (2014)
- [9] “*Higgs Boson Studies at the Tevatron*”, Phys. Rev. D. 88, 052014 (2013)
- [10] “*Combination of Searches for the Higgs Boson Using the Full CDF Data Set*”, Phys. Rev. D. 88, 052013 (2013)
- [11] “*Search for Resonant Top-antitop Production in the Semi-leptonic Decay Mode Using the Full CDF Data Set*”, Phys. Rev. Lett. 110, 121802 (2013)
- [12] “*Evidence for a particle produced in association with weak bosons and decaying to a bottom-antibottom quark pair in Higgs boson searches at the Tevatron*”, Phys. Rev. Lett. 109, 071804 (2012)
- [13] “*Search for a Higgs boson in the diphoton final state using the full CDF data set*”, Physics Letters B 717 (2012) 173181
- [14] “*Combined search for the standard model Higgs boson decaying to a bb pair using the full CDF data set*”, Phys. Rev. Lett. 109, 111802 (2012)
- [15] “*Search for the standard model Higgs boson decaying to a bb pair in events with one charged lepton and large missing transverse energy using the full CDF data set*”, Phys. Rev. Lett. 109, 111804 (2012)

- [16] “*Search for the standard model Higgs boson produced in association with a  $W^\pm$  boson with  $7.5\text{ fb}^{-1}$* ”, Phys. Rev. D. 86, 032011 (2012)
- [17] “*Search for a Higgs Boson in the Diphoton Final State in  $p\bar{p}$  at  $\sqrt{s} = 1.96\text{ TeV}$* ”, Phys. Rev. Lett. 108, 011801 (2012)
- [18] “*Search for a Higgs Boson produced in Association with a W Boson Using a Method Based on Matrix Element Techniques*”, Phys. Rev. D. 85, 072001 (2012)

## Past Publications in Refereed Journals

- [1] “*Observation of Single Top Quark Production and Measurement of  $V_{tb}$  with CDF*”, Phys. Rev. D. 82, 112005 (2010)
- [2] “*Measurement of the  $WW+WZ$  Production Cross Section Using a Matrix Element Technique in Lepton + Jets Events*”, Phys. Rev. D. 82, 112001 (2010)
- [3] “*Studying the Underlying Event in Drell-Yan and High Transverse Momentum Jet Production at the Tevatron*”, Phys. Rev. D. 82, 034001 (2010)
- [4] “*Measurement of the  $WW$  and  $WZ$  production cross section in  $\ell\nu jj$* ”, Phys. Rev. Lett. 104, 101801 (2010)
- [5] “*Search for Standard Model Higgs Bosons in  $WH \rightarrow \ell\nu b\bar{b}$* ”, Phys. Rev. Lett. 103, 101802 (2009)
- [6] “*Observation of Single Top Quark Production*”, Phys. Rev. Lett. 103, 092002 (2009)
- [7] “*Search for a Fermiophobic Higgs Boson Decaying into Diphotons at CDF*”, Phys. Rev. Lett. 103, 061803 (2009)
- [8] “*Measurement of Single Top Quark Production at CDF*”, Phys. Rev. Lett. 101, 250601 (2008)
- [9] “*The Inclusive Jet Cross Section Using the Midpoint Algorithm in RunII at CDF*”, Phys. Rev. D78, 052006 (2008)

Please note that in addition to my primary publications listed above, I have been a member of the CDF author list since January 2006 with almost 400 publications and almost 20,000 citations (based on the SPIRES - High-Energy Physics Literature Database). I have also made major contributions to more than 100 unpublished notes documenting my work for the CDF, Mu2e, and NOvA collaborations. A complete list of publications can be supplied upon request.

## Recent Conference Proceedings and Non-refereed Publications

- [1] “*Progress in the Search for Dark Matter Using Upward-going Muons in NOvA*”, ICHEP 2016
- [2] “*Performance of Wavelength-Shifting Fibers for the Mu2e Cosmic Ray Veto Detector*”, DPF 2015, arXiv:1511.06225
- [3] “*Performance of Scintillator Counters with Silicon Photomultiplier Readout*”, DPF 2015, arXiv:1511.00374
- [4] “*A first look at data from the NOA upward-going muon trigger*”, DPF 2015, arXiv:1511.00155
- [5] “*Fermilab Computing at the Intensity Frontier*”,  
Conference on Computing in High Energy Physics (CHEP2015), J. Phys. Conf. Ser. 664 (2015) 3, 032012
- [6] “*Implementation of an Upward-going Muon Trigger for Indirect Dark Matter Searches at the NOvA Far Detector*”, Conference on Computing in High Energy Physics (CHEP2015), J. Phys. Conf. Ser. 664 (2015) 082034
- [7] “*Recent Evolution of the Offline Computing Model of the NOvA Experiment*”,  
Conference on Computing in High Energy Physics (CHEP2015), J. Phys. Conf. Ser. 664 (2015) 3, 032011
- [8] “*Mu2e Technical Design Report*”,  
The Mu2e Project and the Mu2e Collaboration, arXiv:1211.7019 (2014)
- [9] “*Observation of the s-channel and other studies of single top quarks at the Tevatron*”,  
XXVIII Rencontres de Physique de la Vallée d’Aoste, Italy, arXiv:1405.0071 (2014)
- [10] “*Software Trigger Algorithms to Search for Magnetic Monopoles with the NOvA Far Detector*”, Conference on Computing in High Energy Physics, Journal of Physics, Vol. 513, 2014
- [11] “*Charged Leptons*”,  
Summary Report of Snowmass Community Summer Study 2013, arXiv:1311.5278 (2013)
- [12] “*Design considerations for the cosmic-ray-veto system of the Mu2e experiment*”, Proceedings, APS Division of Particles and Fields, Santa Cruz, CA, arXiv:1310.1377 (2013)
- [13] “*Feasibility Study for a Next-Generation Mu2e Experiment*”,  
Contribution to the Snowmass Community Summer Study 2013, arXiv:1307.1168 (2013)
- [14] “*The Mu2e Conceptual Design Report*”,  
The Mu2e Project and the Mu2e Collaboration, arXiv:1211.7019 (2012)
- [15] “*Updated Combination CDF and D0 Searches for Standard Model Higgs Boson Production with up to  $10.0 \text{ fb}^{-1}$  of Data*”, Tevatron New Phenomena and Higgs Working Group, arXiv:1207.0449 (2012)
- [16] “*Fundamental Physics at the Intensity Frontier*”,  
Intensity Frontier Workshop, arXiv:1205.2671 (2012)
- [17] “*Combined CDF and D0 Search for Standard Model Higgs Boson Production with up to  $10.0 \text{ fb}^{-1}$  of Data*”, Tevatron New Phenomena and Higgs Working Group, arXiv:1203.3774 (2012)



- [18] “*Combined CDF and D0 measurement of WZ and ZZ production with b-tagged jets*”,  
Tevatron New Phenomena and Higgs Working Group, arXiv:1203.3782 (2012)
- [19] “*Combined CDF and D0 Limits on Higgs Boson Production with up to  $8.6 \text{ fb}^{-1}$  of Data*”,  
Tevatron New Phenomena and Higgs Working Group, arXiv:1107.5518 (2011)
- [20] “*Combined CDF and D0 limits on Fermiophobic Higgs Boson Production with up to  $8.2 \text{ fb}^{-1}$* ”,  
Tevatron New Phenomena and Higgs Working Group, arXiv:1109.0576 (2011)
- [21] “*Combined CDF and D0 Searches for the Higgs Boson Decaying to Two Photons*”,  
Tevatron New Phenomena and Higgs Working Group, arXiv:1107.4960 (2011)

## Past Conference Proceedings and Non-refereed Publications

- [1] “*Higgs Boson Searches at CDF*”,  
Contributed to Lake Louise Winter Institute, arXiv:0905.4267 (2009)
- [2] “*Combination of CDF and DØ Single Top Quark Cross Sections Measurements*”,  
Tevatron New Phenomena and Higgs Working Group, arXiv:0908.2171 (2009)
- [3] “*Combination of Single Top Quark Production Results from CDF*”,  
Contributed to ICHEP 2008, arXiv:0809.4670 (2008)
- [4] “*Recent QCD Studies at the Tevatron*”,  
Contributed to XXII Rencontres de Physique de la Vallee d’Aoste, arXiv:0804.4494 (2008)
- [5] “*PDF use from the Tevatron to the LHC*”,  
Contributed to TeV4LHC workshop, QCD Group Report, hep-ph/0605240 (2005)
- [6] “*Slepton Mass Measurements at the LHC II*”,  
Contributed to TeV4LHC workshop, Exotics Group Report, hep-ph/0608322 (2005)
- [7] “*Slepton Mass Measurements at the LHC*”,  
Contributed to Linear Collider Workshop, hep-ph/0507002 (2005)
- [8] “*PYTHIA Tune A, HERWIG, and JIMMY in Run 2 at CDF*”,  
Contributed to Hera and the LHC workshop, hep-ph/0510198 (2005)
- [9] “*The Les Houches Accord PDFs (LHAPDF) and LHAGLUE*”,  
Contributed to Hera and the LHC workshop, hep-ph/0508110 (2005)